



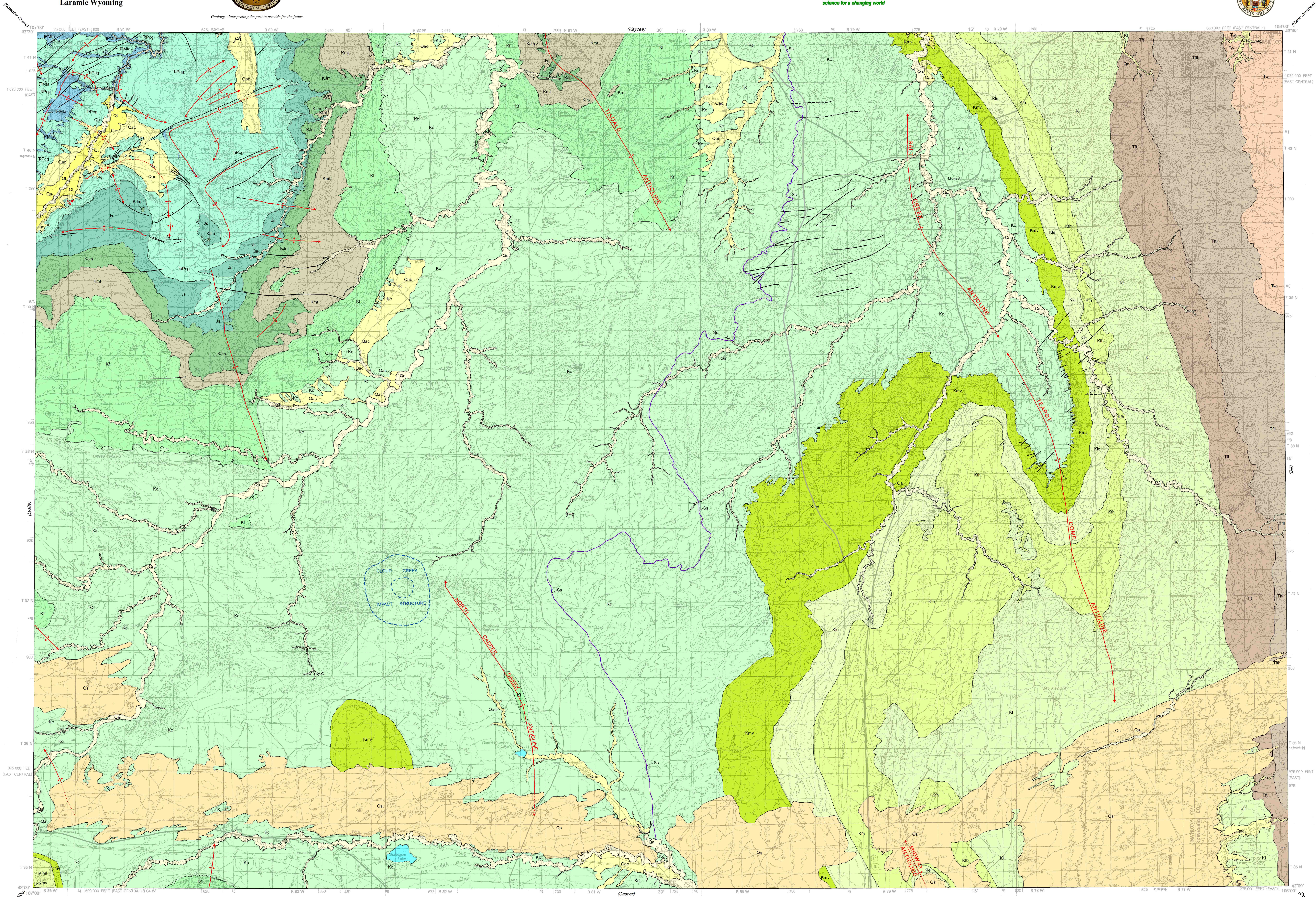
Geology - Interpreting the past to provide for the future



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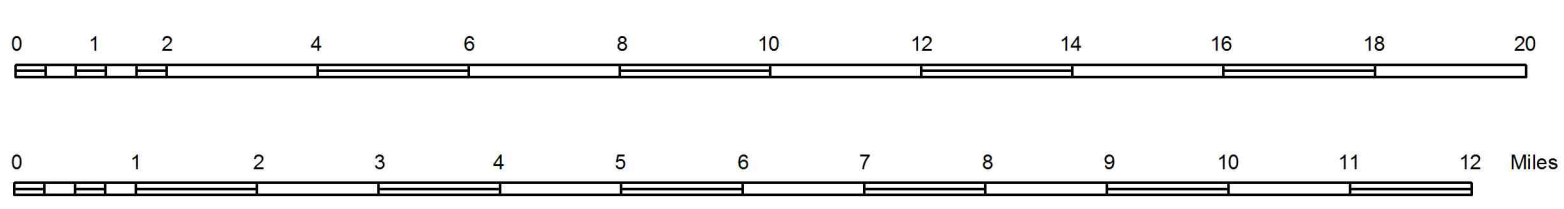


MAP SERIES MS-73
Midwest 1:100,000 - scale Geologic Map



Base map from U.S. Geological Survey 1:100,000 - scale
metric topographic map of the Midwest, Wyoming
30' x 60' Quadrangle, 1987

Projection: Universal Transverse Mercator (UTM), zone 13
North American Datum of 1927 (NAD 27)
10,000-meter grid ticks: UTM, zone 13
25,000-foot grid ticks: Wyoming State Plane Coordinate
System, east central and east zones



Additional copies of this map can be obtained from:
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GEOLOGIC MAP OF THE MIDWEST 30' x 60' QUADRANGLE, NATRONA, CONVERSE, JOHNSON, AND CAMPBELL COUNTIES, WYOMING

by
Seth J. Wittke
2007



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Digital cartography by Seth J. Wittke and Alice J. Vogelmann

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EXPLANATION			
CORRELATION OF MAP UNITS			
Qa	Qac	Qs	Qt
Unconformity			
Tw	Tt		
Unconformity			
Ki	Kch	Kc	Km
Unconformity			
Tp	Tp		
Unconformity			
Ph	Ph		

DESCRIPTION OF MAP UNITS			
Quaternary surficial deposits			
Qa	Alluvial deposits (Holocene)—Unconsolidated and poorly consolidated clay, silt, sand, and gravel, mainly in channel or meander belt of creeks and rivers. Includes lowest level terrace deposits in many of the stream valleys.		
Qac	Mixed alluvium and colluvium (Holocene/Pleistocene)—Sand, silt, clay, and gravel deposited mainly along intermittent streams and rivers; includes slope wash and smaller alluvial fan deposits that coalesce with alluvium and youngest low level terrace deposits		
Qs	Windblown sand (Holocene/Pleistocene)—Primarily gray quartz sand; includes active and inactive (stabilized) sand dunes trending southwest to northeast, especially in the area northeast of Casper.		
Qt	Terrace deposits (Holocene/Pleistocene)—Beds of pebble and cobble gravels and lenses of silt and sand locally cemented by calcium carbonate. Consist of unconsolidated terraces occurring along present drainages, a few feet (0.6 m) to several hundred feet (61 m) above modern flood plains		
Tertiary sedimentary rocks			
Tw	Wasatch Formation (Eocene and Paleocene)?—Lenticular interbeds of gray to light-brown, fine- to coarse-grained, locally conglomeratic, feldspathic to arkosic, cross-bedded sandstone; dark- to light-gray or brown or greenish-gray shale, claystone, and siltstone. Sublaminous and lignitic coal beds and carbonaceous shales occur locally. Thicknesses of over 2,400 feet (730 m) in the Powder River Basin, but only the lowermost part exposed on this quadrangle (description based on Kohout, 1957)		
Tt	Tongue River and Lebou Shale Members undivided (Paleocene)—Yellowish-gray sandstone and siltstone; coals and carbonaceous shales; and, locally, thin lenses of conglomerate. Thickness ranges from about 1,725 to 2,825 feet (525 to 861 m) (Denson and others, 1995)		
Th	Tublock Member (Paleocene)—Distinguished from the conformably overlying Lebou Member by its drab appearance and massive sandstone units. Interbedded tan to buff sandstone, siltstone, dark brown and gray carbonaceous shale, and thin coal beds. Thickness 750 to 1,850 feet (229 to 564 m) (description and thicknesses from Denson and others, 1995)		
Upper Cretaceous sedimentary rocks			
Ki	Lance and Metcete formations and Lewis Shale undivided		
Ki	Lance Formation—Gray shale and drab brown, massive lenticular, concretionary sandstone; thin coal beds in lower half. The sandstone is characterized as a coarsening upward sequence. Thickness approximately 150 to 200 feet (45 to 60 m) (Ver Ploeg and others, 2004)		
Kch	Metcete Formation—Light-gray friable sandstone interbedded with siltstone and dark sandy shale containing marine fossils. The sandstone is characterized as a coarsening upward sequence. Thickness approximately 150 to 200 feet (45 to 60 m) (Ver Ploeg and others, 2004)		
Kc	Fox Hills Sandstone—Brownish gray to yellow-brown sandstone interbedded with siltstone and dark sandy shale containing marine fossils. The sandstone is characterized as a coarsening upward sequence. Thickness approximately 150 to 200 feet (45 to 60 m) (Ver Ploeg and others, 2004)		
Km	Lewis Shale—In Powder River Basin consists of dark-gray shale with thin laminae of light-gray siltstone, fine-grained sandstone in upper half of unit. Upper 15 feet (5 meters) grades into light colored sandstone of the Fox Hills Formation. Contact with Fox Hills placed at 6-inch (15-cm)-thick bentonite layer. Thickness about 1,000 feet (300 m) (description and thickness modified from Love and others, 1979). In southwestern corner of quadrangle consists of a 171-foot (52 m)-thick upper marine tongue of light to dark gray shale and a 305-foot (93 m)-thick lower marine tongue of light to dark gray shale, separated by 400 feet (122 m) of non-marine Metcete Formation (Cserna and others, 1983)		
Kmv	Mesa Verde Formation—Light gray to yellowish gray fine- to medium-grained sandstone and interbedded dark greenish gray shales, with a brown carbonaceous shale near the top. Capped by the Teapot Sandstone Member (not mapped separately), an 8-foot (2.4 m)-thick white fine-grained cross-bedded sandstone. Parkman Sandstone Member (not mapped separately) in lower part of formation commonly contains brown weathering calcareous concretions. Thickness up to 750 feet (229 m) (Ver Ploeg and others, 2004)		
Ks	Cody Shale—Dark gray calcareous fossiliferous marine shale interbedded with light gray fine-grained sandstone, with numerous bentonite beds in the upper two-thirds of the formation. Separation concretions common throughout the shale units. An upper glauconitic fine-grained shaly sandstone (Shannon Sandstone Member) approximately 100 feet (30 m) thick occurs about 1,000 feet (300 m) below the top of the formation. Thickness 3,000 to 3,300 feet (900 to 1,000 m) (description and thickness modified from Kohout, 1957)		
Kt	Frontier Formation—Gray to black shale, and siltstone, bentonite beds, and "salt and pepper" sandstone. First Wall Creek Sandstone Member forms top and Second Wall Creek Sandstone Member occurs lower in the section. Contact with the underlying Mowry Shale is at the base of a 4- to 6-foot- (1.2 to 1.8 m)-thick bentonite bed, locally referred to as the "Clay Spur Bentonite." Thickness approximately 800 to 850 feet (240 to 260 m) (description and thickness modified from Ver Ploeg, 2004)		
Upper and Lower Cretaceous sedimentary rocks			
Knt	Mowry Shale, Muddy Sandstone, and Thermopsis Shale undivided		
Knt	Mowry Shale (Upper Cretaceous)—Hard, dark gray siliceous shale that weathers silver gray and contains thin bentonite beds and abundant fish scales. Lower unit is dark gray to black nonresistant shale with thin interbedded white fine-grained ledge-forming sandstone near the base, grading into the underlying Muddy Sandstone. Contact with overlying Frontier Formation is at the base of the persistent "Clay Spur Bentonite." Thickness approximately 350 feet (107 m) (description and thickness modified from Ver Ploeg, 2004)		
Knt	Muddy Sandstone (Lower Cretaceous)—Tan to gray fine- to medium-grained friable to well indurated sandstone that is 5 to 30 feet (1.5 to 9 m) thick. Easily siltyified by its drab color and grains of black minerals (description and thickness modified from Ver Ploeg, 2004)		
Knt	Thermopsis Shale (Lower Cretaceous)—Dark gray to black soft fissile shale with some interbedded bentonite layers. Ironstone concretions appear in the lower portion of the formation. Thickness 160 to 200 feet (49 to 60 m) (description and thickness modified from Ver Ploeg, 2004)		
Lower Cretaceous and Jurassic sedimentary rocks			
Kjn	Cloverly and Morrison Formations undivided		
Kjn	Cloverly Formation (Lower Cretaceous)—A tripartite unit consisting of a basal tan to white, coarse-grained sandstone and chert pebble conglomerate, locally cross-bedded; and overlain by variegated buff and purple claystones interbedded with light-gray, fine-grained, friable, cross-bedded silt sandstones. Dinosaur bones and bone fragments are common in the upper part of the section. Thickness approximately 100 to 300 feet (30 to 90 m) (description and thickness modified from Love and others, 1979)		
Kjn	Morrison Formation (Upper Jurassic)—Pale-green, olive-green, blue-green to maroon and chalky, white, variegated calcareous and bentonitic claystones interbedded with light-gray, fine-grained, friable, cross-bedded silt sandstones. Dinosaur bones and bone fragments are common in the upper part of the section. Thickness approximately 100 to 300 feet (30 to 90 m) (description and thickness modified from Love and others, 1979)		
Kjn	Sundance Formation (Upper and Middle Jurassic)—Upper part is gray to greenish-gray glauconitic shale with an upper layer consisting of silty shale and calcareous sandstone that weathers brown and is slightly glauconitic. Middle part is red and gray nonglauconitic sandstone and shale and thin gypsum and limestone beds. Lower part is thick-bedded gray to pink sandstone. Thickness approximately 550 feet (170 m) (description and thickness modified from Love and others, 1979)		

Triassic and Permian sedimentary rocks

Tp **Chugwater Group and Goose Egg Formation undivided**—Combined thickness approximately 350 to 1,300 feet (107 to 400 m)

Chugwater Group (Triassic)—Includes from top to bottom, Pope Agie Formation, Crow Mountain Sandstone, Alcona Limestone, and Red Peak Formation. The Pope Agie includes lower limestone unit with upper ocher and purple mudstones; the Crow Mountain is reddish-orange sandstone, locally referred to as the Jedn Formation; the Alcona is purplish gray shaly algal limestone; and the Red Peak is red shale, siltstone, and fine-grained sandstone (description and thickness modified from Love and others, 1979)

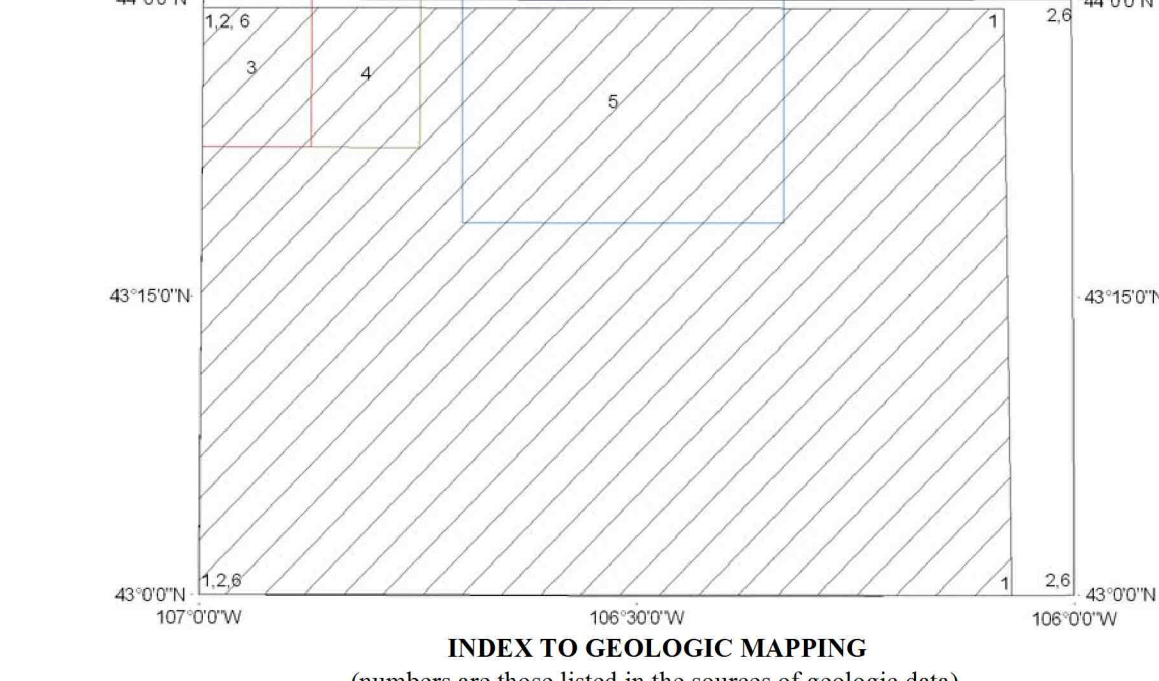
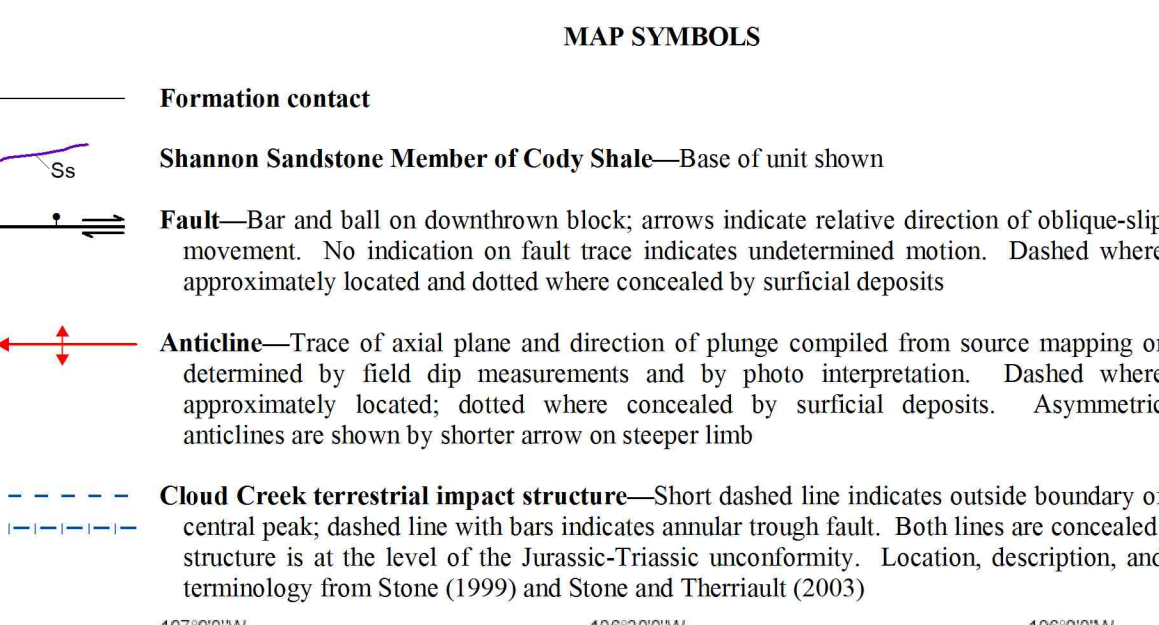
Goose Egg Formation (Permian)—dark-red to reddish-orange shale and siltstone with interbedded gypsum, algal limestone, and dolomite, mainly in the lower part (description and thickness modified from Love and others, 1979)

Pennsylvanian and Mississippian sedimentary rocks

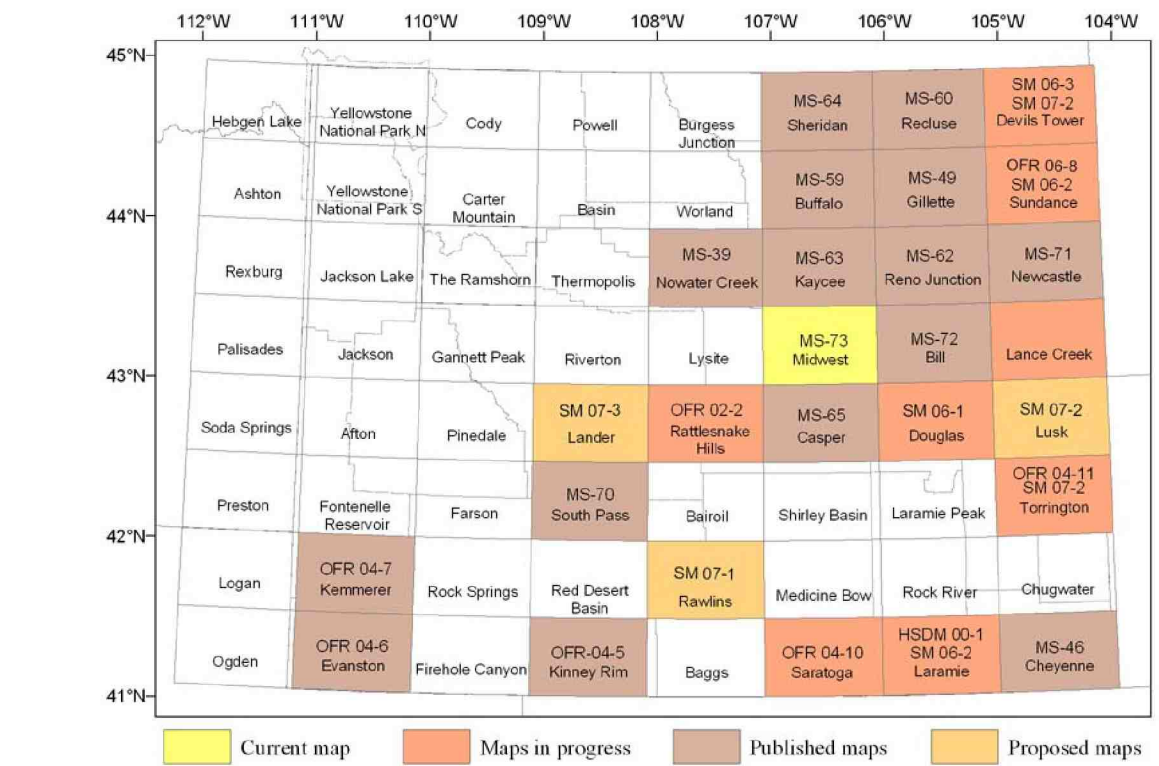
Ph **Tensleep Sandstone and Asmesen Formations undivided**

Tensleep Sandstone (Pennsylvanian)—White to buff, medium- to fine-grained, massive sandstone; interbedded with thin cherty limestone and dolomite beds, especially toward the base. Upper and middle sandstones are usually characterized by large-scale cross-beds. Thickness approximately 350 to 400 feet (107 to 120 m) (description and thicknesses from Ver Ploeg, 2004)

Asmesen Formation (Pennsylvanian and Upper Mississippian)—Includes from top to bottom, gray to purplish limestone and dolomite, interbedded with shale, siltstone, and sandstone; reddish-brown to maroon shale and siltstone with thin beds of sandstone and carbonates; and gray to buff, fine- to medium-grained, cross-bedded sandstone. Persistent sandstone at base is probably Upper Mississippian Darwin Sandstone Member. Thickness approximately 125 to 330 feet (38 to 100 m) (description and thicknesses from Ver Ploeg, 2004)



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KEY TO ABBREVIATIONS
Wyoming State Geological Survey maps: Map Series (MS), Open File Report (OFR), Hazards Section Digital Map (HSDM), and unpublished STATEMAP project (SMP).

INDEX TO 1:100,000-SCALE BEDROCK GEOLOGIC MAPS OF WYOMING